

## **1.1 Radio Astronomy**

### **1.1.1 Maintenance and Calibration**

- Radio astronomy realtime performance scripts were further optimized. These scripts are now available for all MDSCC antennas that participate in VLBI observations. Apart from checking any possible antenna problem in realtime, they also check the subreflector status and advice if it is incorrectly configured.
- New procedures have been defined at station.prc file to make compatible Mark5 recorder commands at Field System versions 9.6.9 and 9.9.0. Therefore FS-9.6.9 schedules can now be executed by FS-9.9.0, and the opposite.
- DSS-63 calibration run using Field System calibration tools (fivept, onoff, gnplt), to measure X-Band gain curve, DPFU, and variation of Tcal (noise diode) versus frequency. A new rxg file (containing ANTAB coefficients) has been generated. This calibration will be applied to incoming European VLBI Network (EGS) observation (DSS-63, EGS Calibration, 480min).
- In order to support incoming EGS observation, full\_cal procedure has been updated, a problem at minical\_src script has been fixed, and new Field System procedures to configure noise diodes have been defined at station.prc. Radio Astronomy local procedures have been changed accordingly.

### **1.1.2 Research & Development**

- Radio Astronomy VSR Interface (RAVI) software has been installed at new Radio Astronomy Controller (RAC) linux PC. A CCS molecule spectrum from the line calibrator TMC-1 was taken using WVSR1 and data was successfully reduced using RAVI.
- Gildas package, a collection of state-of-the-art software oriented toward (sub-) millimeter radio astronomical applications (single dish and interferometry), has been installed at new linux RAC. Part of capabilities of this package will be use to average spectra in real time and adjust integration times accordingly.
- We are currently involved in testing the Multi-Frequency Synthesis VLBI technique, in collaboration with ATOT JPL office, GDSCC, the Astro Space Center (Moscow) and MPIfR (Bonn). These tests are in preparation for the RadioAstron Space VLBI mission.

### **1.1.3 Observations**

#### **1.1.3.1 Host Country Spectroscopy**

During this month spectroscopy observations with DSS-63 antenna were carried out using the SPB500 spectrometer and the MarkIV data acquisition terminal. Additionally the Wide VLBI Science Receiver (WVSR) was configured and data was simultaneously recorded. WVSR filters are configured in order to detect simultaneously different transitions of the same molecule (e.g. ammonia  $\text{NH}_3(1,1)$  and  $\text{NH}_3(2,2)$ ).

Host Country projects carried out with DSS-63 antenna during this period were the following:

- **D63-S01:** study of CCS molecule (22.334 GHz) extended emission in young low-mass protostars. Frequency switching mode was used.
- **D63-S02:** search for water maser emission toward obscured planetary nebulae. Performed during bad weather conditions.
- **D63-S05:** study of ammonia (NH<sub>3</sub>) emission toward massive young stellar objects. The sample consists of regions in different evolutionary stages, and NH<sub>3</sub> will be used to determine the physical properties of the dense gas at each evolutionary stage. Position switching mode was used.
- **D63-S08:** study of ammonia emission in a sample of LBV nebulae.

DOY	minutes scheduled	minutes used	percent good data	Activity	comments
033	350	150	60	“GBRA H/C D63-S05/S01”	Bad weather, bad boresights
044	480	400	100	“GBRA H/C D63-S01/S02/S08”	Good obs
053	215	170	100	“GBRA H/C D63-S05”	New detection! Good obs

### 1.1.3.2 Interferometry

MDSCC participated in 2 Very Long Baseline Interferometric (VLBI) observations (1680 min in total):

- RFC Clock Synchronization on DSS-65 (1 observations; 240 min): four sources were lost (5% data lost) due to antenna problems (DR#M104680).
- RFC Cat M&E on DSS-65 (1 observation; 1440 min): antenna EL oscillations occurred several times (DR#M104656), 21 sources were impacted (4% data lost). Field System FS-9.9.0 crashed during the observation (DR#M104653), 19 sources were lost (5% data lost). After restarting the Field System schedule AZ drives were found to be down (DR#M104654), 8 sources were lost (2% data lost).